COPY FOR MR. J. ALLAN ROSS

HYDRO-ELECTRIC INQUIRY COMMISSION

ENGINEERING DATA

PRINCIPAL CHARACTERISTICS OF H. E. P. C. PLANTS

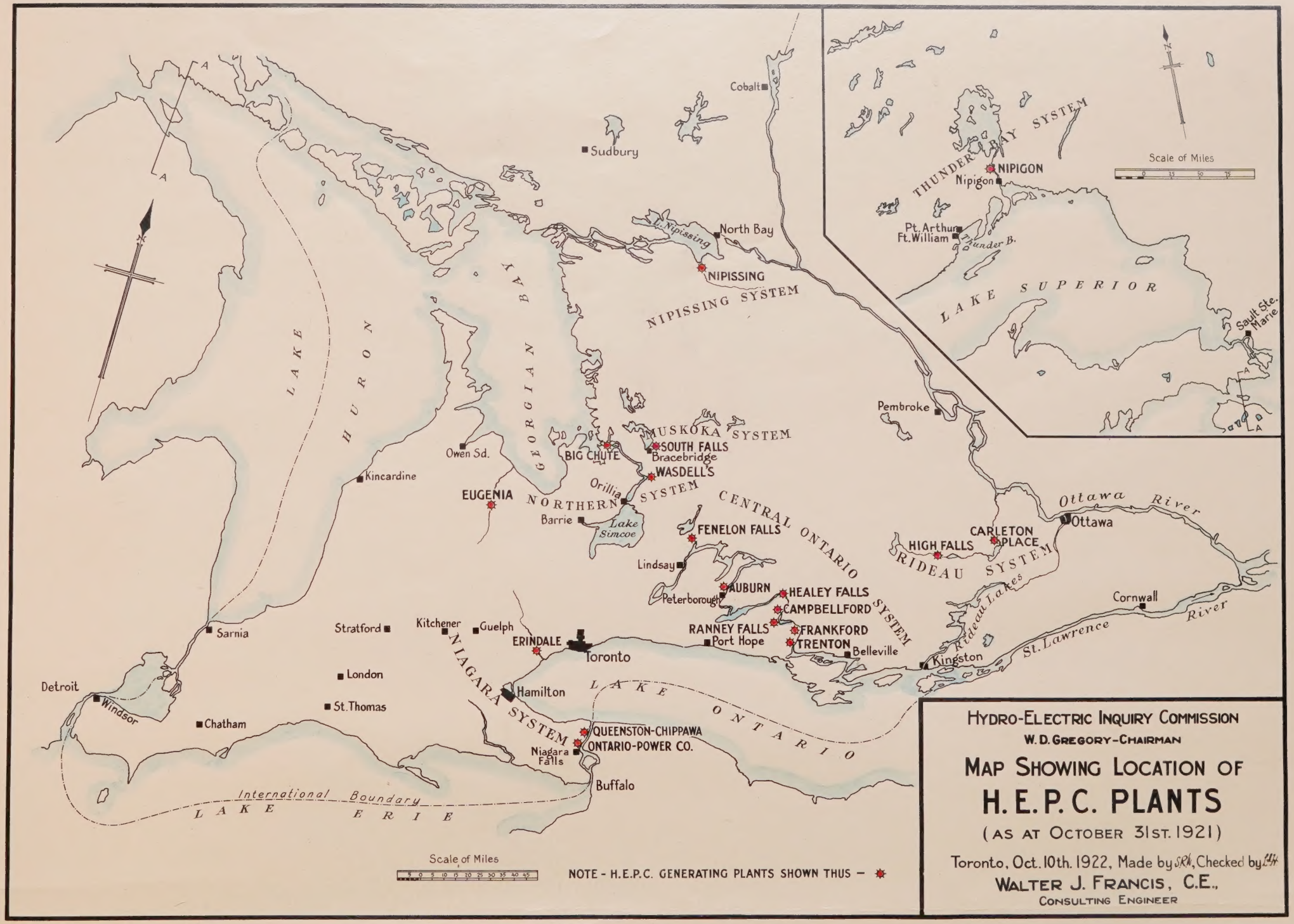
WALTER J. FRANCIS, C. E.
CONSULTING ENGINEER

WALTER J. FRANCIS & COMPANY.

COPY FOR ENCLOSURE TO Mr. J. Allan Ross.

PRINCIPAL CHARACTERISTICS OF H.E.P.C. PLANTS

COPY


HYDRO-ELECTRIC INQUIRY COMMISSION
W. D. GREGORY-CHAIRMAN
MAP SHOWING LOCATION OF
H. E. P. C. PLANTS
(AS AT OCTOBER 31ST. 1921)
Toronto, Oct. 10th. 1922, Made by SRh, Checked by LH
WALTER J. FRANCIS, C.E.,
CONSULTING ENGINEER
NOTE - H.E.P.C. GENERATING PLANTS SHOWN THUS -
Scale of Miles
LAKE HURON
GEORGIAN BAY
LAKE ONTARIO
LAKE ERIE
LAKE SUPERIOR
THUNDER BAY SYSTEM
NIPISSING SYSTEM
MUSKOKA SYSTEM
NORTHERN SYSTEM
CENTRAL ONTARIO SYSTEM
RIDEAU SYSTEM
NIAGARA SYSTEM
NIPIGON
Nipigon
Pt. Arthur
Ft. William
Thunder B.
Sault Ste. Marie
Cobalt
Sudbury
North Bay
L. Nipissing
NIPISSING
Pembroke
Owen Sd.
Kincardine
BIG CHUTE
SOUTH FALLS
Bracebridge
WASDELL'S
Orillia
EUGENIA
Barrie
Lake Simcoe
FENELON FALLS
Lindsay
Peterborough
AUBURN
HEALEY FALLS
CAMPBELLFORD
RANNEY FALLS
Port Hope
FRANKFORD
TRENTON
Belleville
HIGH FALLS
CARLETON PLACE
Ottawa
Ottawa River
Rideau Lakes
Kingston
St. Lawrence River
Cornwall
Sarnia
Stratford
Kitchener
Guelph
ERINDALE
Toronto
Hamilton
London
St. Thomas
Chatham
Detroit
Windsor
QUEENSTON-CHIPPAWA
ONTARIO-POWER CO.
Niagara Falls
Buffalo
International Boundary

Frontispiece

Map showing location of H.E.P.C. Plants

as at October 31st, 1922.

INDEX

INDEX (continued)

PRINCIPAL CHARACTERISTICS OF H.E.P.C. PLANTS

Walter J. Francis.

Preamble.

On July 13th, 1922, I received a preliminary memorandum from Mr. Commissioner R. A. Ross, on behalf of the Hydro-Electric Inquiry Commission, requesting a tabulation of the principal characteristics of the generating plants of the Hydro-Electric Power Commission. Subsequently after a personal interview the scope of the work was decided upon. Mr. Bower, the Secretary, wrote me formal instructions on July 17th, 1922, and I accordingly arranged to obtain the requisite data.

The collection of the data was assigned to Lt.-Col. Wilgar of our staff, and he proceeded to obtain all the figures possible from the official reports of the Hydro-Electric Power Commission, supplementing this by information obtained from departmental heads and other members of the staff of the Hydro-Electric Power Commission. He continued the collection of the data until his return to professorial duties at Queen's University in September, when it was taken up by Lt.-Col. Ellis who practically completed the collection of the information. Having been tabulated, the figures were submitted to Mr. Gaby in their complete form. Under date of October 10th, 1922, Mr. Gaby wrote me as follows:-

> "We are sending herewith tabulations showing the principal characteristics of the Hydro-Electric Power Commission power plants as submitted for our approval. The same have been duly checked, and, as far as we are able to state in the time given

for checking, the corrections have all been made. We believe the figures are accurate enough for all general purposes."

General

The generating plants in operation by the Hydro-Electric Power Commission of Ontario on October 31st, 1921, are eighteen in number and are designated as follows:- Nipissing, Nipigon, South Falls, High Falls, Carleton Place, Fenelon Falls, Auburn, Healey Falls, Campbellford, Ramney Falls, Frankford, Trenton, Ontario Power Co., Brindale, Queenston-Chippawa, Eugenia, Wasdell's and Big Chute. These plants are grouped into systems by the Hydro-Electric Power Commission in the following order:-

Systems	Plants
Nipissing	Nipissing
Thunder Bay	Nipigon
Muskoka	South Falls
Rideau	High Falls Carleton Place
Central Ontario	Fenelon Falls Auburn Healey Falls Campbellford Ramney Falls Frankford Trenton
Niagara	Ontario Power Co. Brindale Queenston-Chippawa
Northern	Eugenia Wasdell's Big Chute

By reference to the frontispiece the location of the several plants and their grouping in systems may be clearly seen. In a general way the frontispiece also shows the waterway on which each plant is located.

It is believed that the figures as compiled are accurate enough for general comparison and information. If, however, it be desired to make a critical study of any plant, careful consideration should be given to all the factors entering into the composition of the items.

I understand that Messrs. Price, Waterhouse & Co. through Mr. Landis, and Mr. Wegenast, are making a general report on the generating plants in regard to ownership and so forth, and that I am to confine my attention to the figures relating to the principal characteristics.

In the nine double pages of tables included herewith as pages 4 to 12 inclusive, the figures are given in order, having regard to the grouping of the generating plants into systems. For each of the eighteen plants forty-four questions are answered. The first twelve questions, being items 1 to 12 inclusive, refer to the hydraulic characteristics. The next six questions, being items 13 to 18 inclusive, have reference to the power characteristics and to the equipment of the generating plants. The next succeeding sixteen questions, being items 19 to 34 inclusive, have reference to historical data and capital costs, while the last group of questions, ten in number and marked items 35 to 44 inclusive, refer to operating costs and unit costs for the year ending October 31st, 1921, the four final items being deduced arithmetically from the earlier figures of fact.

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MIPISSING SYSTEM

Item	Mipissing
HYDRAULIC CHARACTERISTICS OF THE PLANTS OF THE HYDRO-	
1 Name of River	South
2 Drainage Area, Square Miles	294
3 Minimum Precipitation per Annum, Inches	30.9
4 Mean Precipitation per Annum, Inches	34.4
5 Minimum Run-off per Month, Cubic Feet per Second	82
6 Mean Run-off per Annum, Cubic Feet per Second	420
7 Turbine Head, Minimum, Feet	88
8 Turbine Head, Mean, Feet	90
9 Years of Precipitation Records	1916 to 1919
10 Years of Gauging Records	1914 to 1921
11 Water Horse Power, Mean	4,300
12 Water Storage, Million Cubic Feet	965
POWER CHARACTERISTICS AND EQUIPMENT OF THE PLANTS OF THE	
13 Turbines,	
Number and Rating of each, Horse Power	1 @ 1,100 1 @ 1,400
Total Installed Rating, Horse Power	2,500
14 Generators,	
Number and Rating of each, Kilowatts	1 @ 450 1 @ 1,050
Total Installed Rating, Kilowatts	1,500
15 Transformers,	
Number and Rating of each, Kilo-Volt-Amperes	3 @ 900
Total Installed Rating, Kilo-Volt-Amperes	2,700
16 Voltage of Output	22,000
17 Frequency, Cycles	60
18 Overall Efficiency of Plant	80%

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	Nipigon 2 Units	South Falls	High Falls	Carleton Place
ELECTRIC POWER COMMISSION AS AT OCTOBER 31st, 1921.				
	Nipigon	Muskoka	Mississippi	Mississippi
	9,100	677	450	1,150
	16.6	35.0	31.5	31.5
	25.0	41.5	35.0	35.0
	5,750	205	96	305
	6,500	985	515	1,161
	75	102	76	9
	78	100	78	10.5
	1878 to 1923	1877 to 1923	1915 to 1919	1915 to 1919
	1905 to 1921	1915 to 1920	1915 to 1922	1919 to 1921
	57,600	12,100	4,550	1,390
	239,085	1,050	2,620	3,500
HYDRO-ELECTRIC POWER COMMISSION AS AT OCTOBER 31st, 1921.				
	2 @ 12,500	1 @ 750 1 @ 1,000	5 @ 1,200	3 @ 245
	25,000	1,750	3,600	735
	2 @ 8,500	1 @ 360 1 @ 600	4 @ 350 1 @ 700	1 @ 150 1 @ 250
	17,000	960	2,100	400
	4 @ 6,000	5 @ 400	3 @ 750	3 @ 250
	32,000	1,200	2,250	750
	1 spare 119,000	22,000	26,400	26,400
	61	60	60	60
	9 %	8 %	75 %	8 %

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C E N T R A L

	Item	Fenelon Falls	Auburn
	HYDRAULIC CHARACTERISTICS OF THE PLANTS OF THE HOUSE-		
1	Name of River	Sturgeon	Otonabee
2	Drainage Area, Square Miles	1,235	2,8[illegible]
3	Minimum Precipitation per Annum, Inches	23.1	23.1
4	Mean Precipitation per Annum, Inches	32.3	32.3
5	Minimum Run-off per Month, Cubic Feet per Second	*250	*750
6	Mean Run-off per Annum, Cubic Feet per Second	*	*
7	Turbine Head, Minimum, Feet	22.5	17.5
8	Turbine Head, Mean, Feet	22.5	17.5
9	Years of Precipitation Records	1883 to 1914	1883 to 1914
10	Years of Gauging Records	1911 to 1921	1911 to 1921
11	Water Horse Power, Mean	*	*
12	Water Storage, Million Cubic Feet	3,500	3,8[illegible]
	Note:- Items marked thus, *, indicate that		
	POWER CHARACTERISTICS AND EQUIPMENT OF THE PLANTS OF THE		
13	Turbines,		
	Number and Rating of each, Horse Power	2 @ 500	3 @ 950
	Total Installed Rating, Horse Power	1,000	2,850
14	Generators,		
	Number and Rating of each, Kilowatts	2 @ 350	3 @ 500
	Total Installed Rating, Kilowatts	700	1,500
15	Transformers,		
	Number and Rating of each, Kilo-Volt-Amperes	7 @ 135	2 @ 1,875
	Total Installed Rating, Kilo-Volt-Amperes	945	3,750
16	Voltage of Output	1 spare 11,000	6,600, and 2,400 to 44,000
17	Frequency, Cycles	60	60
18	Overall Efficiency of Plant	82%	82%

COPY

Honley Falls	Campbellford	Ranney Falls	Frankford	Trenton
ELECTRIC POWER CONDITIONS AS AT OCTOBER 31st, 1921.				
Trent	Trent	Trent	Trent	Trent
3,500	4,200	4,200	4,600	4,600
23.1	23.1	23.1	23.1	23.1
32.3	32.3	32.3	32.3	32.3
$750	$820	$820	$820	$820
$1,200	$	1,400	$	$
74	22.5	47	17	18.6
74	22.5	54	17	18.6
1883 to 1921	1883 to 1914	1883 to 1914	1883 to 1914	1883 to 1914
1911 to 1921	1911 to 1921	1911 to 1921	1911 to 1921	1911 to 1921
$10,100	$	$5,600	$	$
3,500	3,500	3,500	3,500	3,500
flow is regulated by the Department of Railways and Canals of Canada.				
HYDRO-ELECTRIC POWER CONDITIONS AS AT OCTOBER 31st, 1921.				
3 @ 5,600	5 @ 1,100	2 @ 5,300 Summer 2 @ 5,500 Winter	4 @ 1,200	4 @ 1,400
16,800	5,500	10,600 Summer 11,000 Winter	4,800	5,600
3 @ 3,000	5 @ 600	2 @ 5,600 Summer 2 @ 4,250 Winter	4 @ 650	4 @ 750
9,000	3,000	7,200 Summer 8,500 Winter	2,600	3,000
3 @ 3,750	4 @ 1,125	2 @ 4,500	None	3 @ 3,000
11,250	4,500	9,000	None	9,000
44,000	44,000	44,000	6,600	6,600 to 44,000
60	60	60	60	60
82%	82%	82%	82%	82%

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NIAGARA

Item	Ontario Power Co.	Erindale
HYDRAULIC CHARACTERISTICS OF THE PLANTS OF THE HYDRO-		
1 Name of River	Niagara	Credit
2 Drainage Area, Square Miles	265,440	450
3 Minimum Precipitation per Annum, Inches	Not Relevant	26.6
4 Mean Precipitation per Annum, Inches	Not Relevant	32.2
5 Minimum Run-off per Month, Cubic Feet per Second.	Not Relevant	70
6 Mean Run-off per Annum, Cubic Feet per Second	Not Relevant	385
7 Turbine Head, Minimum, Feet	175	Not Ascertained
8 Turbine Head, Mean, Feet	180 about	56, latterly 57
9 Years of Precipitation Records	Not Relevant	1888 to 1920
10 Years of Gauging Records	Not Relevant	1914 to 1920
11 Water Horse Power, Mean	250,000	2,450
12 Water Storage, Million Cubic Feet	Not Relevant	None at Present
POWER CHARACTERISTICS AND EQUIPMENT OF THE PLANTS OF THE		
13 Turbines, Number and Rating of each, Horse Power	7 @ 11,800 5 @ 15,000 2 @ 16,000 2 @ 18,000	2 @ 840
Total Installed Rating, Horse Power	225,600	1,680
14 Generators, Number and Rating of each, Kilowatts	3 @ 7,500 11 @ 8,776 2 @ 15,000	2 @ 600
Total Installed Rating, Kilowatts	149,036	1,200
15 Transformers, Number and Rating of each, Kilo-Volt-Amperes	18 @ 3,000	None
Total Installed Rating, Kilo-Volt-Amperes	54,000	None
16 Voltage of Output	60,000, 30,000, 12,000 and 2,200	13,200
17 Frequency, Cycles	25	60
18 Overall Efficiency of Plant	88%	82%

Queenston-Chippawa 5 Units	Eugenia	Wandell's	Big Chute
ELECTRIC POWER COMMISSION AS AT OCTOBER 31st, 1921.			
Niagara	Beaver	Severn	Severn
263,440	76	2,075	2,265
Not Relevant	34.2	24.2	24.2
Not Relevant	37.8	32.4	32.5
Not Relevant	60	1,000	1,000
Not Relevant	88	2,000	2,500
296 about	515	9	56
305 about	524	12	56
Not Relevant	1916 to 1921	1873 to 1916	1873 to 1916
Not Relevant	1913 to 1921	1913 to 1918	1913 to 1918
300,000 about	5,240	2,750	15,900
Not Relevant	740	16,500	16,500
HYDRO-ELECTRIC POWER COMMISSION AS AT OCTOBER 31st, 1921.			
5 @ 55,000 on order	2 @ 2,250 1 @ 4,000	2 @ 600	3 @ 1,300 1 @ 2,300
500,000 about	8,500	1,200	6,300
5 @ 36,000 on order	2 @ 1,200 1 @ 2,400	2 @ 320	3 @ 720 1 @ 1,280
180,000 about	4,800	640	3,440
15 @ 15,000 on order	6 @ 900	7 @ 150	7 @ 600
225,000 about	5,400	1,050 1 spare	4,200 1 spare
12,000 to 110,000	22,000	22,000	22,000
25	60	60	60
90% about	88%	80%	88%

2.

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NIPISSING SYSTEM

Item	Nipissing
HISTORICAL DATA AND CAPITAL COSTS OF THE PLANTS OF	
19 Maximum Demand in 1921, Kilowatts	1,265
20 Load Factor for Year 1921	49.1%
21 Output for 1921, Average, Kilowatts	620
22 Power Factor Limits	85% to 92%
23 Construction Year	1910 to 1911
24 Extension Year	1920 to 1921
25 Purchase Year	1916
26 Present Owner	Ontario
27 Capital Cost, Lands and Water Rights	$ 31,324
28 Capital Cost, Dams and Water Structures	$121,455
29 Capital Cost, Power House	$ 22,577
30 Capital Cost, Equipment	$104,550
31 Capital Cost, Intangible Assets	$ 37,681
32 Capital Cost, Total	$323,297
33 Capital Cost per Horse Power, 1921, Average Output	$ 389
34 Capital Cost per Horse Power, Turbine Rating	$ 147

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THUNDER BAY SYSTEM	MUSKOKA SYSTEM		KIDMAN SYSTEM
Kinlyon & Units	South Falls	High Falls	Carleton Place
THE HYDRO-ELECTRIC POWER COMMISSION AS AT OCTOBER 31st, 1921.			
9,600	1,056	1,375	Not Operating
40.8%	50.8%	54.6%	Not Operating
3,920	557	490	Not Operating
78.1% to 100%	72% to 77%	40% to 75%	Not Operating
1919 to 1921	1915 to 1916	1919	1910
None	1915 to 1916	None	1913
None	1915	1918	1920
H.E.P.C.	H.E.P.C.	H.E.P.C.	H.E.P.C.
Included in Item 28	$ 17,554	$ 10,478	$ 10,275
$4,151,066	$ 52,932	$279,507	$ 12,450
$ 557,965	$ 20,318	$240,758	$ 20,682
$ 948,955	$ 57,546	$164,711	$ 17,464
$ None	$ None	$ None	$ None
$5,657,974	$140,321	$695,414	$ 60,871
$ 1,075	$ 216	$ 1,064	Not Operating
$ 226	$ 85	$ 193	Not Operating

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G E N E R A L

Item	Fenelon Falls	Auburn
	HISTORICAL DATA AND CAPITAL COSTS OF THE PLANTS OF	
19 Maximum Demand in 1921, Kilowatts	700	2,000
20 Load Factor for Year 1921	57%	66%
21 Output for 1921, Average, Kilowatts	400	1,320
22 Power Factor Limits	50% to 90%	50% to 90%
23 Construction Year	1899	1911 to 1912
24 Extension Year	None	None
25 Purchase Year	1916	1916
26 Present Owner	Ontario	Ontario
27 Capital Cost, Lands and Water Rights	$ 23,395	$ 25,140
28 Capital Cost, Dams and Water Structures	$ 1,426	$ 56,543
29 Capital Cost, Power House	$ 3,130	$116,195
30 Capital Cost, Equipment	$ 48,604	$ 69,624
31 Capital Cost, Intangible Assets	$150,000	$127,500
32 Capital Cost, Total	$226,555	$416,910
33 Capital Cost per Horse Power, 1921, Average Output	$442	$ 235
34 Capital Cost per Horse Power, Turbine Rating	$227	$ 146

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ONTARIO SYSTEM

	Healey Falls	Campbellford	Ramsay Falls	Frankford	Trenton
THE HYDRO-ELECTRIC POWER COMMISSION AS AT OCTOBER 31st, 1921.					
	12,300	5,160	None	2,860	4,000
	30%	57%	None	51%	51%
	3,690	1,800	None	1,460	2,040
	50% to 90%	50% to 90%	50% to 90%	50% to 90%	50% to 90%
	1913 to 1914	1910	1920 to 1922	1913	1911
	1919	None	None	None	None
	1916	1916	None	1916	1916
	Ontario	Ontario	Ontario	Ontario	Ontario
	$ 9,706	$ 2,979	$ 37,800	$ 2,182	$ 14,746
	$ 575,204	$ 44,650	$ 197,800	$ 78,261	$ 45,285
	$ 147,388	$ 68,160	$ 567,850	$ 21,489	$ 31,596
	$ 461,676	$172,687	$ 666,850	$144,394	$141,400
	$ 325,000	$100,000	$ 225,000	$125,000	$125,000
	$1,518,974	$388,465	$1,695,300	$371,426	$356,027
	$ 306	$ 161	$ None	$ 190	$ 150
	$ 90	$ 71	$ 170	$ 77	$ 64

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N I A G A R A

Item		Ontario Power Co.	Brindale
		HISTORICAL DATA AND CAPITAL COSTS OF THE PLANTS OF	
19	Maximum Demand in 1921, Kilowatts	146,800	680
20	Load Factor for Year 1921	63.2%	66%
21	Output for 1921, Average, Kilowatts	94,000	455
22	Power Factor Limits	81.5% to 87%	90% to 96%
23	Construction Year	1908 to 1915	1910
24	Extension Year	1906 to 1919	None
25	Purchase Year	1917	1917
26	Present Owner	Ontario	H.E.P.C.
27	Capital Cost, Lands and Water Rights	Included in Item 51	Included in Item 29
28	Capital Cost, Dams and Water Structures	$ 5,927,125	$36,253
29	Capital Cost, Power House	$ 2,874,566	$ 5,367
30	Capital Cost, Equipment	$ 5,252,316	$58,152
31	Capital Cost, Intangible Assets	$10,000,000	$ None
32	Capital Cost, Total	$22,054,065	$101,942
33	Capital Cost per Horse Power, 1921, Average Output	$175	$ 534
34	Capital Cost per Horse Power, Turbine Rating	$ 98	$ 85

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SYSTEM NORTHERN SYSTEM

Menominee-Chippewa 5 Units	Eugenia	Randall's	Big Cinto
THE HYDRO-ELECTRIC POWER CAPACITY AS AT OCTOBER 31st, 1921.			
None	4,290	660	4,300
None	56.1%	49.7%	41.5%
None	1,550	427	1,700
Not Known	46% to 98%	90% to 100%	84% to 99%
1917 to 1925	1914 to 1915	1913 to 1914	19 9
None	1917 to 1918	None	1915 to 1919
Not Relevant	1914	1913	1914
H.E.P.C	H.E.P.C.	H.E.P.C.	H.E.P.C.
Not Established	$157,254	$ 8,140	$ 1,540
Not Established	$459,790	$ 19,863	$145,865
Not Established	$144,705	$ 50,118	$ 57,646
Not Established	$278,416	$ 64,544	$323,190
Not Established	$ None	$ None	$134,011
Not Established	$990,273	$141,985	$652,255
Not Established	$ 475	$ 249	$ 272
Not Established	$ 116	$ 118	$ 130

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MIPISSING SYSTEM

Item	Mipissing
	OPERATING AND DEBT COSTS FOR 1921 FOR THE PLANTS OF
35 Operating Cost, Labour, and	
36 Operating Cost, Material	$ 9,450
37 Maintenance, including Taxes, Depreciation, etc.	$ 4,963
38 Municipal Expense	$ None
39 Fixed Charges	$15,680
40 Total Operating Expense	$30,113
41 Operating Cost, Minus Fixed Charges, per Horse Power, 1921, Average Output	$ 17.40
42 Operating Cost, Minus Fixed Charges, per Horse Power, Turbine Rating	$ 6.57
43 Operating Cost, Plus Fixed Charges, per Horse Power, 1921, Average Output	$ 36.30
44 Operating Cost, Plus Fixed Charges, per Horse Power, Turbine Rating	$ 13.66

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WHITEFISH BAY SYSTEM	MUSKOKA SYSTEM		RIDEAU SYSTEM
Nipigon 2 Units	South Falls	High Falls	Carleton Place

THE HYDRO-ELECTRIC POWER COMMISSION AS AT OCTOBER 31st, 1921.

$ 12,121	$ 4,662	$ 5,204	Not Operating
$ 2,069	$ 362	$ 1,455	Not Operating
$ 15,759	$ 2,502	$ 2,777	Not Operating
$ 452	$ 510	$ 1,071	Not Operating
$157,000	$11,261	$63,246	Not Operating
$165,6[illegible]1	$19,297	$53,955	Not Operating
$ 5.45	$ 11.70	$ 16.00	Not Operating
$ 1.15	$ 4.60	$ 2.94	Not Operating
$ 25.30	$ 27.00	$ 62.50	Not Operating
$ 7.45	$ 11.00	$ 15.00	Not Operating

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G E N E R A L

Item	Fonelon Falls	Auburn
	OPERATING AND UNIT COSTS FOR 1921 FOR THE PLANTS OF	
35 Operating Cost, Labour, and		
36 Operating Cost, Material	$ 5,797	$ 9,522
37 Maintenance, including Taxes, Depreciation, etc.	$ 1,710	$ 1,450
38 Municipal Expense	$ None	$ None
39 Fixed Charges	$12,600	$23,180
40 Total Operating Expense	$20,107	$34,152
41 Operating Cost, Minus Fixed Charges, per Horse Power, 1921, Average Output	$ 16.00	$ 6.20
42 Operating Cost, Minus Fixed Charges, per Horse Power, Turbine Rating	$ 7.50	$ 3.85
43 Operating Cost, Plus Fixed Charges, per Horse Power, 1921, Average Output	$ 37.50	$ 19.30
44 Operating Cost, Plus Fixed Charges, per Horse Power, Turbine Rating	$ 20.00	$ 12.00

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ONTARIO SYSTEM

	Hanley Falls	Campbellford	Ranney Falls	Frankford	Trenton
THE HYDRO-ELECTRIC POWER COMMISSION AS AT OCTOBER 31st, 1921.					
	$ 40,452	$18,513	Not Operating	$16,069	$21,874
	$ 4,859	$ 4,316	Not Operating	$ 1,186	$ 2,182
	$ None	$ None	None	$ None	$ None
	$ 84,400	$21,650	Not Operating	$20,650	$19,860
	$129,711	$44,479	Not Operating	$38,705	$43,916
	$ 9.10	$ 9.50	Not Operating	$ 9.20	$ 8.50
	$ 1.62	$ 4.15	Not Operating	$ 3.75	$ 4.30
	$ 26.30	$ 18.50	Not Operating	$ 19.70	$ 16.05
	$ 4.65	$ 8.10	Not Operating	$ 8.05	$ 7.85

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NIAGARA

Item	Ontario Power Co.	Brindale

OPERATING AND UNIT COSTS FOR 1921 FOR THE PLANTS OF

35	Operating Cost, Labour, and		
36	Operating Cost, Material	$ 180,087	$ 5,071
37	Maintenance, including Taxes, Depreciation, etc.	$ 124,058	$ 1,229
38	Municipal Expense	$ None	$ None
39	Fixed Charges	$1,618,840	$ 8,137
40	Total Operating Expense	$1,922,985	$14,437
41	Operating Cost, Minus Fixed Charges, per Horse Power, 1921, Average Output	$ 2.41	$ 34.62
42	Operating Cost, Minus Fixed Charges, per Horse Power, Turbine Rating	$ 1.35	$ 3.75
43	Operating Cost, Plus Fixed Charges, per Horse Power, 1921, Average Output	$ 15.25	$ 79.32
44	Operating Cost, Plus Fixed Charges, per Horse Power, Turbine Rating	$ 8.50	$ 8.59

WALTER J. FRANCIS & COMPANY.

COPY FOR ENCLOSURE TO Mr. J. Allan Ross.

SYSTEM NORTHERN SYSTEM

	Moonstone-Chippawa 5 Units	Eugenia	Wasdell's	Big Chute
THE HYDRO-ELECTRIC POWER COMMISSION AS AT OCTOBER 31st, 1921.				
	Not Operating	$ 10,081	$ 5,255	$ 8,047
	Not Operating	$ 3,383	$ 769	$ 1,785
	Not Operating	$ 15,766	$ 2,259	$ 7,842
	None	$ 5,054	$ 904	$ 3,372
	Not Operating	$ 70,540	$ 9,634	$56,820
	None	$105,634	$18,821	$77,864
	Non Existent	$ 16.40	$ 16.00	$ 8.80
	Non Existent	$ 4.00	$ 7.65	$ 3.25
	Non Existent	$ 50.75	$ 32.90	$ 32.50
	Non Existent	$ 12.40	$ 15.70	$ 12.00

COPY

General Notes

The whole of the foregoing information has been obtained from the records of the Hydro-Electric Power Commission or has been based thereon by deduction, and it refers to the conditions as they existed on the 31st of October, 1921.

The Carleton Place plant, of the Rideau system, did not operate during the year 1921. The Ranney Falls plant, of the Central Ontario system, and the Queenston-Chippawa plant, of the Niagara system, were still incomplete on October 31st, 1921. The Erindale plant, also of the Niagara system, operated only nine hours per day during 1921, so that the figures given under items 41 to 44, inclusive, are not comparable with those of the other plants. In the case of the plants of the Central Ontario system and of the Niagara system, the operating cost has not been separated as between labour and material on the records, and this division is not readily ascertainable.

Walter J. Francis
Consulting Engineer.

Toronto, October 10th, 1922.